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(54) **APPARATUS FOR THERMAL TREATMENT OF TISSUE**

VORRICHTUNG ZUR THERMISCHEN BEHANDLUNG VON GEWEBE

APPAREIL DE TRAITEMENT THERMIQUE DES TISSUS

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Description

BACKGROUND

1. Technical Field

[0001] The present disclosure relates generally to a method and apparatus for thermal treatment of tissue and, more particularly, to an auxiliary apparatus to be used with a conventional endoscope to provide the endoscope with thermal treatment capabilities. The auxiliary apparatus is particularly contemplated for use with a cystoscope or a urethroscope for hyperthermia treatment of prostatic tissue.

2. Background of the Related Art

[0002] Benign prostate hyperplasia (BPH) or hyperplasia affects over one out of every two males over the age of fifty. BPH is the non-cancerous enlargement of the prostate gland and is characterized generally by a constriction of the urethra by the prostate gland. An array of symptoms are associated with BPH including frequent urination, complications in urinary flow and associated pain.

[0003] Generally there are two primary methods for treating BPH, namely, drug therapy and surgical intervention. Drug therapy incorporates the use of one or more drugs such as Proscar™ and Hydrin™ to either reduce the size of the prostate or to relax the urethral muscles thereby facilitating the normal functioning of the urinary system. Known drug therapies, however, are limited in their effectiveness and present many drug side effect concerns.

[0004] Surgical methods for treating BPH include transurethral resection of the prostate (TURP), transurethral incision of the prostate (TUIP), visual laser assisted prostatectomy (VLAP), balloon dilation and stenting. TURP is the most common method employed for BPH treatment today and involves the insertion of an electrosurgical cutting instrument through the urethral passage. The cutting elements of the instrument are positioned adjacent the prostate gland, and the instrument is energized such that the cutting elements selectively cauterize and resect tissue from the core of the prostate. The TURP procedure, however, has many side effects including bleeding, retrograde ejaculation, impotence, incontinence, edema and a prolonged recovery period for the patient. An example of an electrosurgical cutting instrument utilized in conjunction with a TURP procedure is disclosed in U.S. Patent No. 5,192,280.

[0005] Transurethral incision of the prostate (TUIP) involves the use of an electrocautery device which is passed through the urethra. The device is employed to make multiple incisions in the prostate, thereby permitting the prostate to be displaced from the urethra wall to create an opening for urine flow. Success with the TUIP procedure is generally limited providing only temporary relief and requiring a subsequent repeat of the procedure in the future.

[0006] Visual laser assisted prostatectomy (VLAP) includes insertion of a laser catheter through the urethra and directing laser energy laterally through the catheter sleeve at the urethral wall and the prostatic tissue. The laser energy causes the tissue to coagulate. The coagulated tissue eventually necrosis from lack of blood flow and is naturally removed from the body. Drawbacks of VLAP include increased recovery time, acute pain and irritation, and undesired burning of the urethral wall. Examples of methods and apparatuses utilized in VLAP treatment of BPH are disclosed in U.S. Patent No. 5,242,438 to Saadatmanesh et al. and U.S. Patent No. 5,322,507 to Costello.

[0007] Balloon dilation procedures for BPH involve expanding and stretching the enlarged prostate with a balloon catheter to relieve pressure off the constricted urethra while stenting incorporates the insertion of tiny wire-mesh coils which expand into a scaffold to hold the urethra open. Balloon dilation and stenting, however, are only temporary procedures typically requiring follow up within a year period. In addition, stenting presents complications of stent migration and consequent irritation.

[0008] Transurethral microwave therapy (TUMT) and high intensity focused ultrasound (HIFU) have been developed for the treatment of BPH. In accordance with a TUMT procedure, a foley-type urethral catheter having a microwave emitting antenna at a probe end is inserted into the urethral passage for a period of time sufficient to treat the tissue by microwave radiation. Intraurethral applicators of this type are described in U.S. Patent Nos. 4,967,765, 5,234,004 and 5,326,343. The drawbacks of TUMT include the inability to focus the heat energy in the prostatic area and the inability to achieve high temperatures uniformly within the prostate.

[0009] High intensity focused ultrasound (HIFU) includes directing high intensity ultrasound waves at the prostate tissue to create heat in a precise area to coagulate and necrose tissue. A transurethral probe is utilized to create the ultrasound beams for both imaging and ablation of the prostatic tissue. Disadvantages of this procedure include the inability to directly focus the ultrasound energy at the prostatic tissue.

[0010] A more recent form of treatment for BPH involves thermally treating prostatic tissue with radio frequency electromagnetic energy. For example, one current technique, known as transurethral needle ablation (TUNA™), involves the transurethral application of a medical instrument having a built-in RF needle electrode system. The TUNA™ instrument is inserted into the urethra and advanced to a position adjacent the prostate. Thereafter, the RF needles are advanced to penetrate the urethral wall and access the prostatic tissue. The RF system is activated whereby a RF current is transmitted through each electrode to pass through the tissue to a grounding pad thereby forming a necrotic legion which is eventually absorbed by the body. Apparatuses and

methods for treating BPH via the TUNA™ technique are disclosed for example in U.S. Patent No.: 5,366,490.

[0011] The TUNA technique has several disadvantages which detract from its usefulness. In particular, the TUNA instruments are generally complex typically incorporating built in optical systems, aspiration systems, etc... As a result, the instruments are relatively expensive to manufacture. Moreover, the TUNA instruments are generally enlarged by virtue of the various systems incorporated within the instrument, thus, increasing patient trauma and discomfort during use.

[0012] US 5,472,441 discloses a device having the features of the pre-amble of claim 1.

[0013] Accordingly, the present invention is directed to an auxiliary apparatus for the RF thermal treatment of prostatic tissue. This apparatus is intended for use in conjunction with a conventional endoscope such as a cystoscope and incorporates an RF system and associated mechanism that is at least partially positionable within the working channel of the scope. The apparatus by use in conjunction with a conventional cystoscope makes use of the existing systems, e.g., optical and illumination, of the scope, which effectively results in a less complex and less expensive RF thermal treatment device. Furthermore, the apparatus may be used in cystoscopes as small as 5mm (or even smaller) in diameter thereby providing a less invasive system for transurethral ablation as compared to the TUNA instrument and technique.

SUMMARY

[0014] The present invention is directed to an auxiliary electromagnetic thermal treatment apparatus for use with an endoscope to provide the endoscope with electromagnetic thermal treatment capabilities, as defined in appended claim 1.

[0015] The present disclosure is also directed to a system for thermal treatment comprising an endoscope and the auxiliary thermal treatment device. A method for thermally treating tissue is also disclosed utilizing an endoscope and a thermal treatment apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Preferred embodiment(s) of the present disclosure are described herein with reference to the drawings wherein:

FIG. 1 is a perspective view of the auxiliary apparatus for thermal treatment of tissue in accordance with the principles of the present disclosure;

FIG. 2 is a cross-sectional view taken along the lines 2-2 of FIG. 1 illustrating the outer sleeve, the probe delivery unit disposed within the outer sleeve and the electrodes disposed within the delivery tubes of the delivery unit;

FIG. 3 is a side elevational view of the probe delivery unit;

FIG. 4 is an axial view of the probe delivery unit as viewed from its proximal end;

FIG. 5 is an axial view of the probe delivery unit as viewed from its distal end;

FIG. 6 is a top elevational view of the probe delivery unit;

FIG. 6A is a perspective view of the distal end of the probe delivery unit;

FIG. 7 is a side elevational of the handle of the apparatus of FIG. 1;

FIG. 8 is a cross-sectional view taken along the lines 8-8 of FIG. 7;

FIG. 9 is a cross-sectional view taken along the lines 9-9 of FIG. 7;

FIG. 10 is a top cross-sectional view of the handle illustrating the first and second actuators of the handle;

FIG. 10A is an isolated view illustrating connection of the probe delivery unit to the first actuator;

FIG. 11 is a side cross-sectional view of the handle further illustrating the connection of the second actuating member to the electrodes;

FIG. 12 is a view illustrating insertion of a cystoscope with mounted auxiliary thermal treatment apparatus within the urethral passage of the patient;

FIG. 13 is a cross-sectional view taken along the lines 13-13 of FIG. 12 illustrating the apparatus of FIG. 1 positioned within the working channel of the cystoscope;

FIG. 14 is an enlarged perspective view of the distal end portion of the cystoscope illustrating the delivery tubes of the probe delivery unit contained within the working channel of the scope;

FIG. 15 is a view illustrating distal movement of the first actuator to deploy the distal end portion of the delivery tubes of the probe delivery unit;

FIG. 16 is a view similar to the view of FIG. 14 illustrating deployment of the distal end of the delivery tubes of the probe delivery unit whereby the distal end assumes its normal unstressed condition angularly oriented relative to the longitudinal axis of the apparatus;

FIG. 17 is a side plan view of the distal end of the cystoscope in partial cross-section further illustrating deployment of the delivery tubes with the electrodes in a retracted position disposed within the tubes;

FIG. 18 is a view similar to the view of FIG. 15 illustrating distal movement of the second actuating member to advance the electrodes through the delivery tubes of the probe delivery unit and within the patient's prostatic tissue;

FIG. 19 is a view similar to the view of FIG. 16 illustrating the electrodes in the advanced position;

FIG. 20 is a view of an alternate embodiment of the auxiliary thermal treatment apparatus where a greater portion of the electrode is exposed to provide an increased thermal treatment capacity;

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] The apparatus of the present disclosure is intended to deliver electromagnetic energy to tissue for thermal treatment of the tissue including tissue ablation, tissue vaporization and/or tissue coagulation. The apparatus has particular application in the treatment of benign prostate hyperplasia (BPH) with electromagnetic radio frequency (RF) energy, however, it is to be appreciated that the apparatus is not limited to such application. For example, the apparatus is not limited to the treatment of BPH, but, may be used in other surgical procedures such as cardiac ablation, cancer treatment, etc.... Moreover, the apparatus may be used in any minimally invasive procedure where thermal treatment of tissue is desired and access to the tissue is limited.

[0018] The apparatus is particularly intended to be used in conjunction with an endoscope such as a cystoscope, fiber scope, laparoscope, urethroscope, etc... to provide the scope with thermal treatment capabilities. More specifically, the apparatus is at least partially insertable within the working channel of an endoscope, which is positioned in the body to access a targeted tissue area, to thermally treat the desired tissue.

[0019] Referring now to FIGS. 1-2, apparatus 100 includes handle 102 and elongate body 104 connected to the handle 102 and extending distally therefrom. Handle 102 includes frame 106 which is preferably fabricated from a suitable rigid polymeric material or, in the alternative, from stainless steel or an aluminum alloy. Frame 106 is advantageously dimensioned to be grasped by the hands of the surgeon. Handle 102 further includes first and second actuators 108, 110 which are mounted for movement relative to the frame 106 to operate the apparatus.

[0020] Elongate body 104 may include outer sleeve 112 preferably fabricated from a flexible material such as Nitinol. It is envisioned that outer sleeve 112 may alternately be rigid if, for example, it is intended to be used with a rigid scope. Outer sleeve 112, if provided, ranges from about 25 to about 40 millimeters (mm) in length, preferably, about 37 mm and ranges from about 1.5 to about 2.5 millimeters in diameter, preferably about 2.3 mm. Outer sleeve 112 defines axial bore 114 extending therethrough. Other dimensions are also contemplated. Alternatively, the outer sleeve may be eliminated.

[0021] Referring now to FIGS. 2-6A, in conjunction with FIG. 1, probe delivery unit, identified generally by reference numeral 116, is disposed within axial opening 114 of outer sleeve 112. Probe guide 116 is adapted for reciprocal longitudinal movement within the opening 114 and includes first and second hollow delivery (directional) tubes 118a, 118b. Delivery tubes 118a, 118b are preferable connected to each other for a major portion of their respective lengths, but are separated at the distal end portions 120a, 120b as best depicted in FIGS. 6 and 6A. Delivery tubes 118a, 118b accommodate electromagnetic probes 122 therein (FIG. 2) and function in guiding the probes 122 at desired orientations within the tissue.

[0022] Referring particularly to FIGS. 3-6A, delivery tubes (or catheter) 118a, 118b of probe guide 116 are preferably fabricated from a shape memory metal such as NITINOL and are preferably joined to each other by welding or with the use of adhesives. In the normal condition of delivery tubes 118a, 118b, the distal ends 120a, 120b of the tubes 118a, 118b each assume the arcuate configuration depicted in FIGS. 3-6A, i.e., the distal end portions 120a, 120b have memory to define the arcuate orientation as shown, thus, providing arcuate paths for electromagnetic probes 122 to follow to penetrate the tissue. The particular orientation of memory portions 120a, 120b of delivery tubes 118a, 118b can be varied depending on the objectives of the surgical procedure. The distal end or memory portions 120a, 120b of delivery tubes 118a, 118b readily adapt a linear configuration when confined in the outer sleeve 112 of elongated portion 104 as will be discussed.

[0023] In a preferred embodiment (e.g., in BPH application), memory portions 120a, 120b of delivery tubes 118a, 118b define a radius of curvature "r" ranging between about 250(6.35 mm) to about 400 inches (10.2 mm), preferably about 312 inches (7.92 mm). Memory portions 120a, 120b are also separated by an angle "T" ranging from about 45 to about 90 (degrees). Clearly other dimensions and angular orientations of memory portions 120a, 120b are contemplated as well.

[0024] With reference again to FIG. 2, electromagnetic probes 122 disposed within delivery tubes 118a, 118b include bipolar electrodes formed of a thin solid wire capable of carrying an electromagnetic radiofrequency (RF) current. The electrodes are relatively flexible to follow along the path defined by delivery tubes 118a, 118b, but, sufficient in rigidity to be advanced into tissue. The electrodes are preferably made of Nitinol so they can return to their normally straight configuration after being bent by the delivery tubes. The electrodes each have a pointed tip to facilitate penetration through the tissue. Each electrode has an insulating layer, designated by reference numeral 124, which extends along a major portion of its length to prevent damage to non-targeted body tissue. Each electrode is therefore electrically isolated from its delivery tube. Insulating layer 124 terminates to expose the distal penetrating portions of the electrodes 122, thus, permitting the transmission of electromagnetic RF current to the targeted body tissue. Alternatively, monopolar electrodes could be provided.

[0025] Referring now to FIGS. 7-11, probe unit 116 extending through outer sleeve 112 is operatively connected to first actuator 108. In a preferred arrangement, first actuator 108 includes an inner recess 125 which receives the proximal end of probe guide 116 in interfitting relation as depicted in FIG. 10A. Other mounting arrangements for connecting actuator 108 and probe guide 116 are envisioned as well such as the use of adhesives, screws, or the like. Longitudinal movement of first actu-

ator 108 causes corresponding longitudinal movement of probe delivery unit 116 within outer sleeve 112. That is, first actuator 108 is moveable to cause reciprocal movement of probe guide 116 between a first retracted position where the distal end or memory portions 120a, 120b of guide 118a, 118b are contained within outer sleeve 112 and a second advanced position where the memory portions 120a, 120b extend beyond the distal end of outer sleeve 112 and assume their angularly oriented positions as will be discussed hereinbelow.

[0026] Second actuator 110 is operatively connected to electromagnetic probes 122 disposed within delivery tubes 118a, 118b. Any conventional means appreciated by one skilled in the art for connecting actuator 110 to electromagnetic probes 122 may be utilized. In the preferred embodiment, an interfitting relationship of the proximal ends of electromagnetic probes 122 with an inner recess of second actuator 110 (such as the arrangement disclosed above with first actuator 108) will be employed. Second actuator 110 is moveable to cause corresponding motion of electromagnetic probes 122 within their respective delivery tubes 118a, 118b to extend the penetrating end portions of the probes 122 beyond the tubes for deployment into tissue.

[0027] As seen in FIGS. 7, 10 and 11, a pair of conductive wires 126 are provided to connect electromagnetic probes 122 to coupling 128 mounted to handle 104. Coupling 128 is connectable to an external radio frequency energy source "s" as schematically depicted in FIG. 1.

[0028] Referring now to FIG. 12, apparatus 100 is shown positioned within a conventional cystoscope 200 for thermal treatment of prostrate "p" to alleviate the symptoms of BPH. One conventional cystoscope 200 with which the apparatus of the present disclosure can be utilized is the ACN Flexible CystoNephroscope manufactured by Circon ACMI. Cystoscope 200 includes handle 202 and a flexible elongated portion 204 connected to the handle 202 and extending distally therefrom. Cystoscope 200 incorporates an optical system to permit viewing of the tissue to be treated. As depicted in FIG. 13, the optical system preferably consists of flexible fiber optic bundles (identified by reference numeral 206) which are accommodated within a longitudinal bore extending through the elongated portion 204 of the scope 200. The fiber optic bundles 206 extend to eyepiece 208 where the surgeon can view the image transmitted by the optical system.

[0029] Cystoscope 200 also includes an illumination system which provides illuminating light to the targeted tissue area. The illumination system includes a plurality of optical fibers 210 which are accommodated within a plurality of longitudinal channels (two are shown) of elongated portion 204 and extend within handle 202 where they terminate at illumination coupler 212. Illumination coupler 212 is connectable to a conventional light source as is known in the art. Cystoscope 200 further includes a working channel 214 extending through flexible elongated portion 204 and terminating at channel port 216 of handle 202. Working channel 214 is adapted to receive various surgical instrumentation through channel port 216 (e.g., thermal treatment apparatus 100) to permit the performance of surgical procedures at the distal end of the cystoscope 200. Cystoscope 200 is preferably a 5mm scope.

Operation

[0030] The use of apparatus 100 with cystoscope 200 in conjunction with the thermal treatment of prostatic tissue will now be discussed. Cystoscope 200 is inserted through urethral passage "u" of the patient and advanced within the passage until the distal end of the scope is adjacent prostate gland "p". Thereafter, elongate body 104 of apparatus 100 is inserted into working channel 214 of cystoscope 200 and advanced into the working channel 214 until handle 102 of the apparatus contacts channel port 216 of scope handle 202. As an alternative method of insertion, apparatus 100 may be positioned within cystoscope 200 prior to insertion within the urethral passage "u" and the entire assembly may be then advanced within the urethral passage. It is envisioned that handle 102 of apparatus 100 may incorporate a locking mechanism to lockingly engage channel port 216 of handle 202 of the cystoscope 200.

[0031] With reference now to FIG. 14, probe delivery unit 116 is shown in its retracted position. In such position, the distal end portions 120a, 120b of delivery tubes 118a, 118b are constrained by outer sleeve 112 (and elongated portion 204 of scope 200) thereby assuming a general linear configuration within the sleeve 112. Thereafter, first actuator 108 is distally advanced as depicted in FIG. 15 to move probe delivery unit 116 from its retracted position of FIG. 14 to its extended position of FIG. 16. Upon exiting working channel 214 of cystoscope 200, the distal ends or memory portions 120a, 120b of delivery tubes 118a, 118b are no longer constrained by outer sleeve 112, and, thus are free to assume their normal unstressed curved configurations depicted in FIG. 16 and FIG. 16A. By exiting through the distal end face of the working channel 214 of cystoscope 200, the deployment of delivery tubes 118a, 118b can be monitored with the optical system of cystoscope 200. That is, both 0 degree and oblique viewing is achieved. In the extended position of delivery tubes 118a, 118b, the distal end portions 120a, 120b may slightly extend beyond the outer circumference of scope 200, but, however, do not penetrate the urethral lining. It is to be noted that the degree of deployment of memory portions 120a, 120b of delivery tubes 118a, 118b may be selected to thereby achieve desired angular orientations of the memory portions 120a, 120b, consequently, controlling the orientation of the deployed electrodes. (As noted above, alternately, outer sleeve 112 need not be provided and the apparatus is advanced through the working channel to expose the delivery tubes.)

[0032] Referring now to FIGS. 17-19, with distal end portions 120a, 120b in their extended positions, attention

is directed to deploying the electromagnetic probes 122. FIG. 17 depicts the electromagnetic probes 122 in their retracted position within delivery tubes 118a, 118b. Second actuator 114 is selectively distally advanced to advance electromagnetic probes 122 from delivery tubes 118a, 118b as depicted in FIG. 18. During advancing movement, the penetrating end portions 126 of probes 122 flex or bend to conform to the curved configuration of memory portions 122a, 122b of the delivery tubes 118a, 118b to pierce the urethral wall "u" and enter the prosthetic tissue "p". The degree of deployment of electromagnetic probes 122 may be selectively controlled (e.g., partial deployment) with second actuator 110 to thereby provide a level of control over the thermal treatment field generated by the probe.

[0033] The system is then energized to thermally treat (e.g., ablate, vaporize or cauterize) the desired prosthetic tissue with RF energy. As a result of this treatment, the prosthetic tissue BPH necroses and dies, thus, relieving pressure off the urethral wall and alleviating the symptoms of BPH. During treatment, the depth of penetration of penetrating end portions 126 of electromagnetic probes 122 may be selectively adjusted by movement of second actuator 110 to permit specific regions of the prosthetic tissue "p" to be targeted for thermal treatment thus providing heating pattern flexibility and control. During treatment, insulating layer 124 of electromagnetic probes 122 preferably contact the urethral wall "u" to prevent damage to the wall.

[0034] Upon completion of the procedure, the system is de-energized and the cystoscope 200 and apparatus are removed from the urethral passage "u".

[0035] FIG. 20 is a perspective view of the distal end of cystoscope 200 with an alternate auxiliary thermal treatment apparatus mounted within the working channel 214 (FIG. 13) of the scope. This thermal treatment apparatus is identical to the apparatus described in connection with FIG. 1 except that in accordance with this embodiment, a greater portion or length of the inner electromagnetic probe 122 is exposed (i.e., uninsulated) to increase the thermal treatment region generated by the probes (Compare with FIG. 19). It is to be appreciated that the lengths of the exposed electrode portions i.e. the length of insulation, may be varied to achieve desired thermal treatment objectives.

[0036] While the above description contains many specifics, these specifics should not be construed as limitations on the scope of the invention as defined by the appended claims, but merely as exemplifications of preferred embodiments thereof. For example, microwave or other forms of electromagnetic energy can be utilized.

Claims

1. An auxiliary electromagnetic thermal treatment apparatus (100, 400) for use with an endoscope to provide the endoscope (200) with electromagnetic thermal treatment capabilities, which comprises:

a handle portion (102)

an elongate portion (104) extending from the handle portion, the elongate portion dimensioned to be at least partially inserted within a working channel of an endoscope, the elongate portion including:

at least one delivery tube (118a, 118b) longitudinally moveable relative to the handle portion for extending a portion beyond the working channel of the endoscope; and

an electromagnetic probe (122) disposed within the delivery tube and longitudinally moveable relative to the delivery tube to extend a probe end portion thereof beyond the delivery tube and within tissue, a tube actuator (108) mounted to the handle portion and operatively connected to the delivery tube, the tube actuator moveable to move the delivery tube between a first retracted position and a second advanced position

a probe actuator (110) mounted to the handle portion and operatively connected to the electromagnetic probe, the actuator moveable to extend the probe end portion beyond the delivery tube; the apparatus **characterised in that:**

the delivery tube includes a memory portion (120a, 120b,) comprised of shape memory material and defining a normally unstressed curved configuration, whereby movement of the memory portion beyond the working channel of the endoscope causes the memory portion to assume the normal unstressed curved configuration, and **in that** the electromagnetic probe is adapted to follow the curved configuration of the memory portion of the delivery tube in the normal unstressed condition thereof.

2. The auxiliary apparatus according to claim 1 wherein the elongate portion includes first and second delivery tubes (118a, 118b), the first and second delivery tubes each having an electromagnetic probe disposed therein.

3. The auxiliary apparatus according to either of the preceding claims wherein the elongate portion includes a flexible outer sleeve (112), the delivery tube being at least partially disposed within the outer sleeve.

4. The auxiliary apparatus according to any one of

claims 1 to 3 wherein the electromagnetic probe is a bipolar electrode.

5. The apparatus according to any one of claims 1 to 3 wherein the electromagnetic probe is a monopolar electrode.

6. A system for thermal treatment of tissue, which comprises:

an endoscope (200) including:

a frame;
an elongated endoscopic portion (204) extending from the frame, the endoscopic portion having a working channel (214) extending along a portion of the length thereof; and the auxiliary electromagnetic thermal treatment apparatus of any preceding claim, wherein the elongate portion is at least partially insertable within the working channel.

7. The combination of claim 6 wherein the working channel of the endoscopic portion of the endoscope includes an axial bore extending through the distal end face of the endoscopic portion.

8. The combination of claim 6 or 7 wherein the endoscope includes an optical system (206, 208) for viewing an image of an object and an illumination system (212) for providing illuminating light.

Patentansprüche

1. Hilfsvorrichtung (100, 400) für eine elektromagnetische thermische Behandlung zur Verwendung mit einem Endoskop, um dem Endoskop (200) elektromagnetische thermische Behandlungsmöglichkeiten zur Verfügung zu stellen, welche umfasst:

einen Griffabschnitt (102),
einen länglichen Abschnitt (104), der sich von dem Griffabschnitt erstreckt, wobei der längliche Abschnitt bemessen ist, um zumindest teilweise innerhalb eines Arbeitskanals eines Endoskops eingebracht zu werden, wobei der längliche Abschnitt umfasst:

zumindest einen Zuführungsschlauch (118a, 118b), der relativ zu dem Griffabschnitt in Längsrichtung beweglich ist, um einen Abschnitt über den Arbeitskanal des Endoskops hinaus zu erstrecken, und
einen elektromagnetischen Fühler (122), der innerhalb des Zuführungsschlauchs angeordnet und relativ zu dem Zuführungsschlauch in Längsrichtung beweglich ist, um einen Fühlerendabschnitt davon über den Zuführungsschlauch hinaus und innerhalb von Gewebe zu erstrecken;
einen Schlauchaktor (108), der an dem Griffabschnitt montiert und mit dem Zuführungsschlauch wirkverbunden ist, wobei der Schlauchaktor beweglich ist, um den Zuführungsschlauch zwischen einer ersten, zurückgezogenen Position und einer zweiten, vorgeschobenen Position zu bewegen,
einen Fühleraktor (110), der an dem Griffabschnitt montiert und mit dem elektromagnetischen Fühler wirkverbunden ist, wobei der Aktor beweglich ist, um den Fühlerendabschnitt über den Zuführungsschlauch hinaus zu erstrecken, wobei die Vorrichtung **dadurch gekennzeichnet ist, dass**
der Zuführungsschlauch einen Gedächtnisabschnitt (120a, 120b) enthält, der ein Formgedächtnismaterial umfasst und eine normal entspannte gekrümmte Anordnung definiert, wodurch eine Bewegung des Gedächtnisabschnitts über den Arbeitskanal des Endoskops hinaus den Gedächtnisabschnitt dazu bringt, die normale entspannte gekrümmte Anordnung anzunehmen, und **dadurch**, dass der elektromagnetische Fühler darauf angepasst ist, der gekrümmten Anordnung des Gedächtnisabschnitts des Zuführungsschlauchs in dessen normalen entspannten Zustand zu folgen.

2. Hilfsvorrichtung nach Anspruch 1, wobei der längliche Abschnitt erste und zweite Zuführungsschläuche (118a, 118b) enthält, wobei die ersten und zweiten Zuführungsschläuche jeweils einen elektromagnetischen Fühler darin angeordnet haben.

3. Hilfsvorrichtung nach einem der vorstehenden Ansprüche, wobei der längliche Abschnitt eine flexible äußere Hülse (112) enthält, wobei der Zuführungsschlauch zumindest teilweise innerhalb der äußeren Hülse angeordnet ist.

4. Hilfsvorrichtung nach einem der Ansprüche 1 bis 3, wobei der elektromagnetische Fühler eine bipolare Elektrode ist.

5. Vorrichtung nach einem der Ansprüche 1 bis 3, wobei der elektromagnetische Fühler eine monopolare Elektrode ist.

6. System zur thermischen Behandlung von Gewebe, welches umfasst:

ein Endoskop (200), enthaltend:

einen Rahmen,
einen länglichen endoskopischen Abschnitt (204), der sich von dem Rahmen erstreckt, wobei der endoskopische Abschnitt einen Arbeitskanal (214) aufweist, der sich entlang eines Abschnitts der Länge davon erstreckt, und
die Hilfsvorrichtung für eine elektromagnetische thermische Behandlung nach einem vorstehenden Anspruch, wobei der längliche Abschnitt zumindest teilweise innerhalb des Arbeitskanals einbringbar ist.

7. Kombination nach Anspruch 6, wobei der Arbeitskanal des endoskopischen Abschnitts des Endoskops eine axiale Bohrung enthält, die sich durch die distale Endfläche des endoskopischen Abschnitts erstreckt.

8. Kombination nach Anspruch 6 oder 7, wobei das Endoskop ein optisches System (206, 208) zum Sehen eines Bilds eines Objekts und ein Beleuchtungssystem (212) zum Schaffen von beleuchtendem Licht enthält.

Revendications

1. Appareil de traitement thermique électromagnétique auxiliaire (100, 400) pour utilisation avec un endoscope pour donner à l'endoscope (200) des capacités de traitement thermique électromagnétique, qui comprend:

une portion de poignée (102);
une portion oblongue (104) s'étendant de la portion de poignée, la portion oblongue étant dimensionnée pour être au moins partiellement insérée dans un canal de travail d'un endoscope, la portion oblongue incluant:

au moins un tube de délivrance (118a, 118b) déplaçable longitudinalement par rapport à la portion de poignée pour étendre une portion au-delà du canal de travail de l'endoscope; et
une sonde électromagnétique (122) disposée dans le tube de délivrance et déplaçable longitudinalement par rapport au tube de délivrance pour étendre une portion d'extrémité de sonde de celui-ci au-delà du tube de délivrance et dans le tissu,
un actionneur de tube (108) monté sur la portion de poignée et fonctionnellement relié au tube de délivrance, l'actionneur de tube étant déplaçable pour déplacer le tube de délivrance entre une première position rétractée et une seconde position avancée,
un actionneur de sonde (110) monté sur la portion de poignée et fonctionnellement relié à la sonde électromagnétique, l'actionneur étant déplaçable pour étendre la portion d'extrémité de la sonde au-delà du tube de délivrance; l'appareil étant **caractérisé en ce que:**

le tube de délivrance comprend une portion de mémoire (120a, 120b) constituée d'un matériau à mémoire de forme et définissant une configuration courbée normalement non contrainte, par quoi le mouvement de la portion à mémoire au-delà du canal de travail de l'endoscope amène la portion à mémoire à avoir la configuration courbée normale non contrainte, et **en ce que** la sonde électromagnétique est apte à suivre la configuration courbée de la portion à mémoire du tube de délivrance dans l'état normal non contraint de celui-ci.

2. Appareil auxiliaire selon la revendication 1, où la portion oblongue comprend des premier et second tubes de délivrance (118a, 118b), les premier et second tubes de délivrance ayant chacun une sonde électromagnétique disposée dans ceux-ci.

3. Appareil auxiliaire selon l'une quelconque des revendications précédentes, où la portion oblongue comprend un manchon extérieur flexible (112), le tube de délivrance étant au moins partiellement disposé dans le manchon extérieur.

4. Appareil auxiliaire selon l'une quelconque des revendications 1 à 3, où la sonde électromagnétique est une électrode bipolaire.

5. Appareil selon l'une quelconque des revendications 1 à 3, où la sonde électromagnétique est une électrode monopolaire.

6. Système pour le traitement thermique de tissu, qui comprend:

un endoscope (200) incluant:

un châssis;
une portion endoscopique oblongue (204) s'étendant du châssis, la portion endoscopique ayant un canal de travail (214) s'étendant le long d'une portion de la longueur de celle-ci; et
l'appareil de traitement thermique électromagnétique auxiliaire selon l'une quelconque des revendications précédentes, où la

portion oblongue est au moins partiellement insérable dans le canal de travail.

7. Combinaison selon la revendication 6, où le canal de travail de la portion endoscopique de l'endoscope comprend un perçage axial s'étendant à travers la face d'extrémité distale de la portion endoscopique.

8. Combinaison selon la revendication 6 ou 7, où l'endoscope comprend un système optique (206, 208) pour voir une image d'un objet et un système d'illumination (212) pour fournir de la lumière d'illumination.

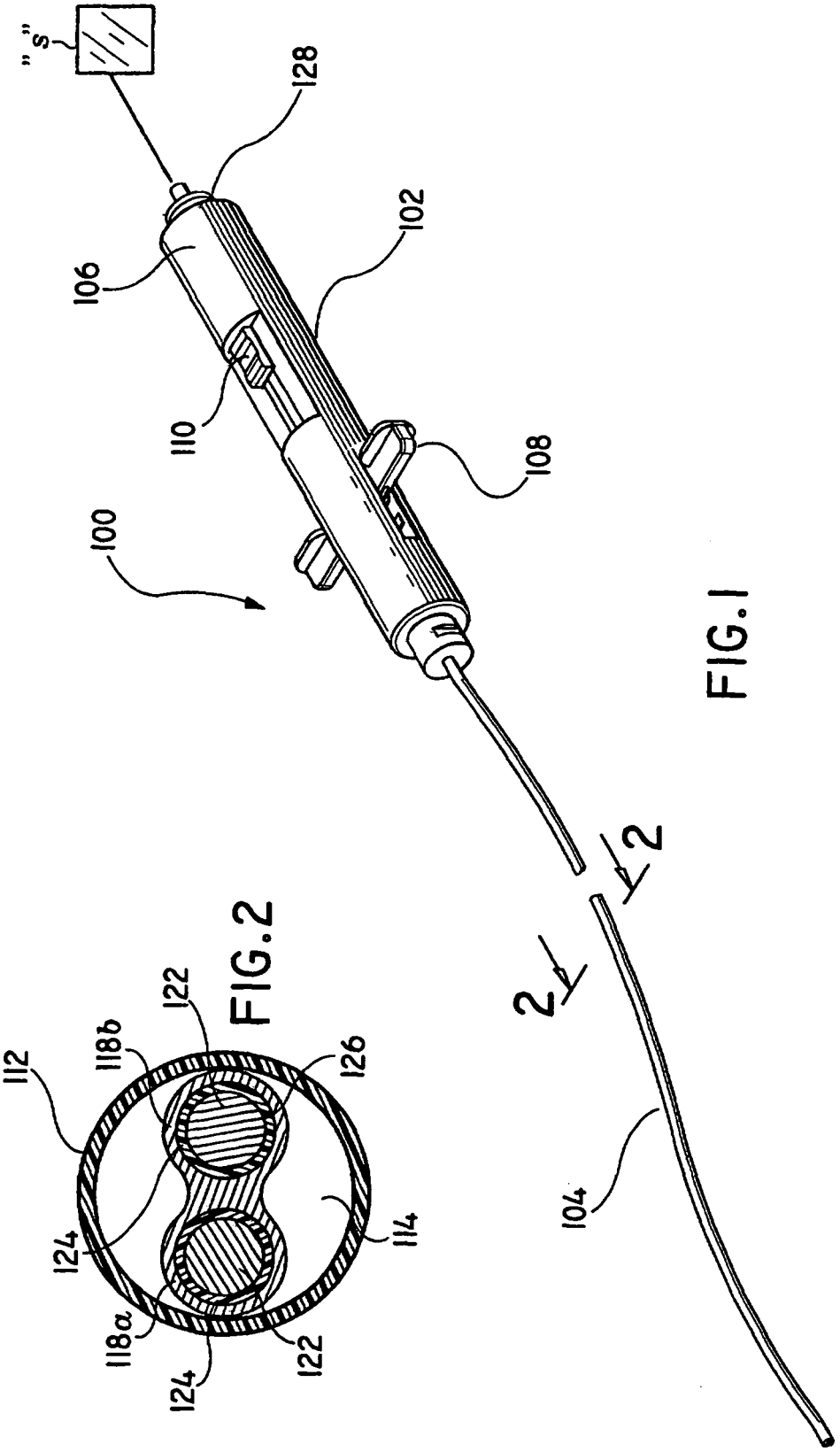
"S"
128
102
106
110
108
100
2
2
104

FIG. 1

122
118b
112
126
124
114
118a
122
124

FIG. 2

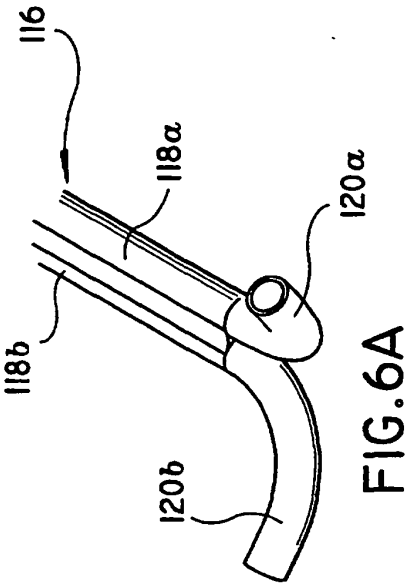

FIG.6A

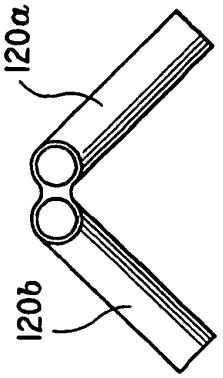

FIG.4

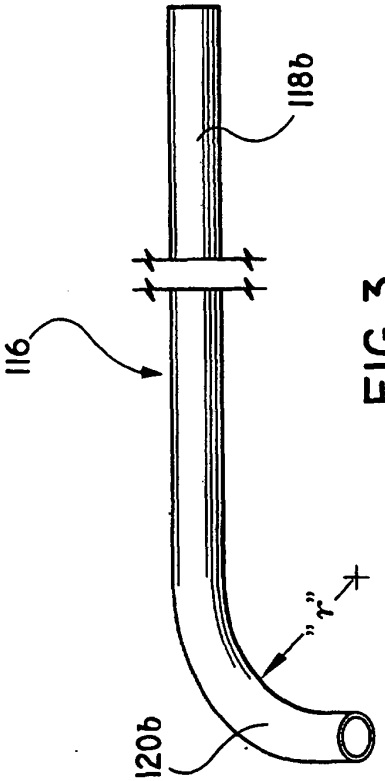

FIG.3

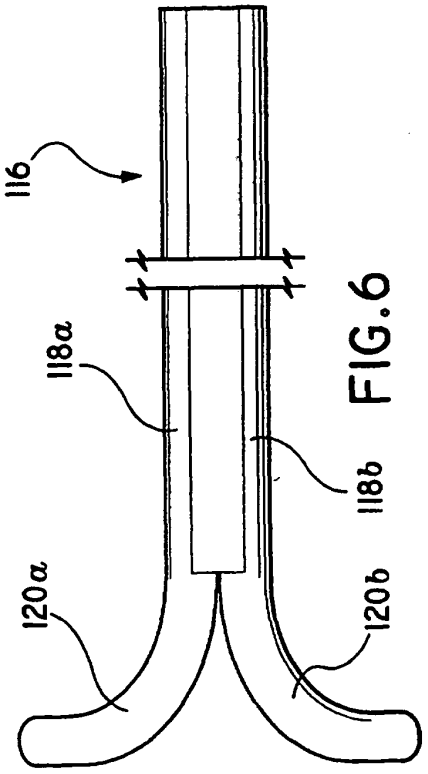

FIG.6

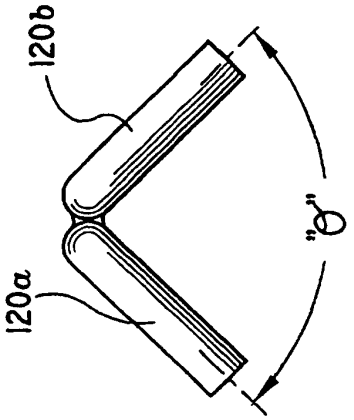

FIG.5

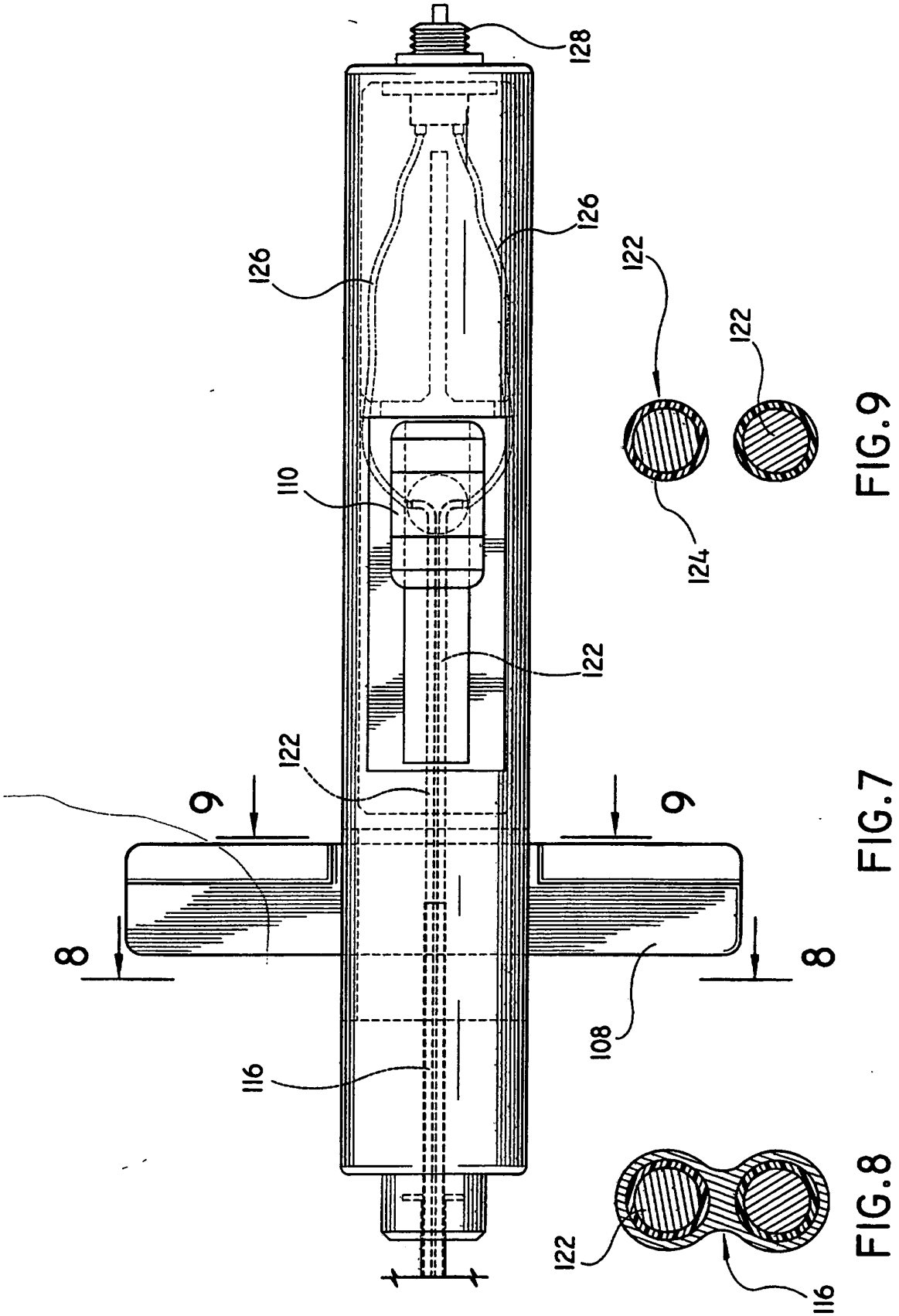

FIG.7

FIG.9

FIG.8

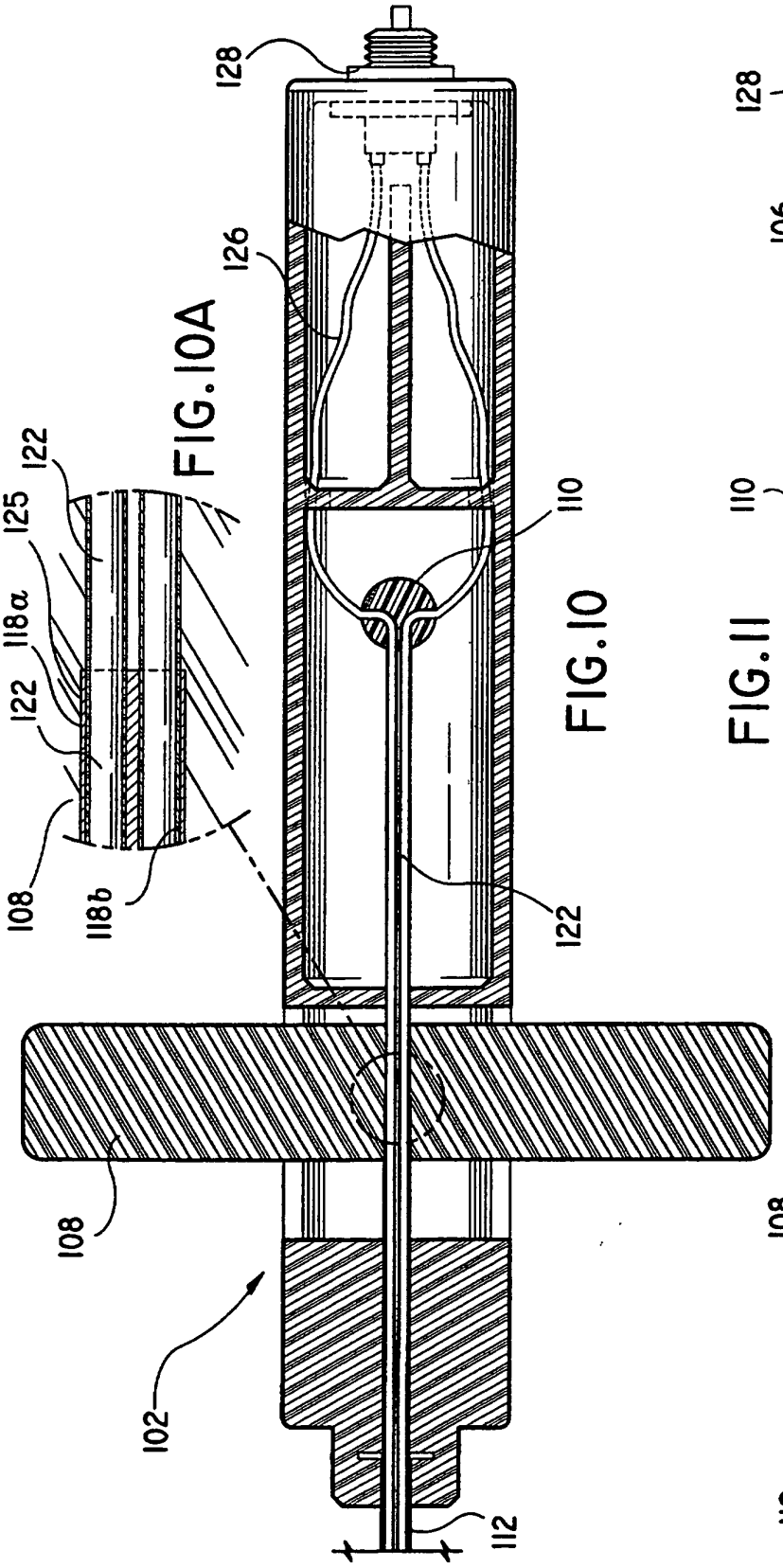

FIG.10A

FIG.10

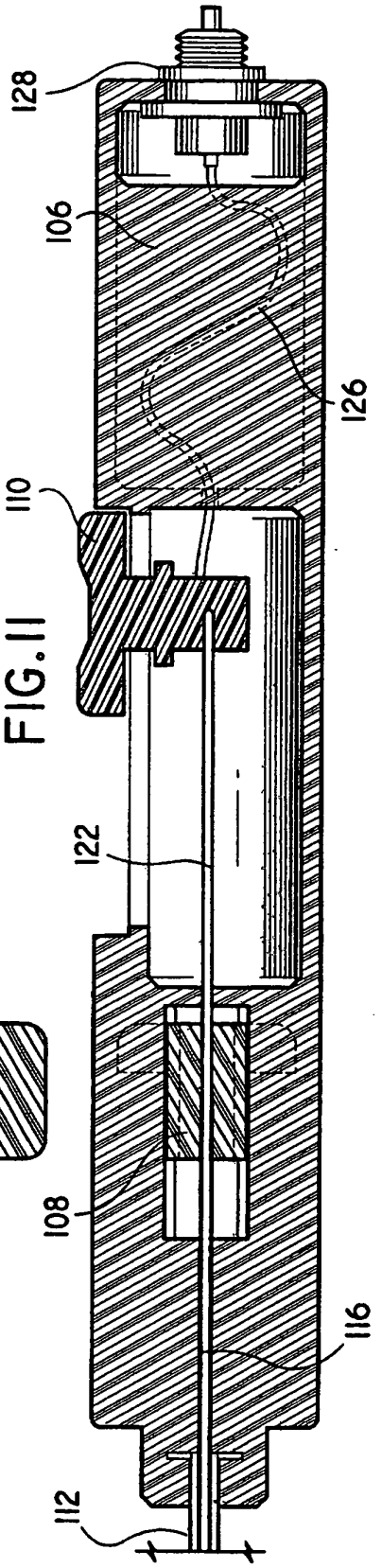

FIG.11

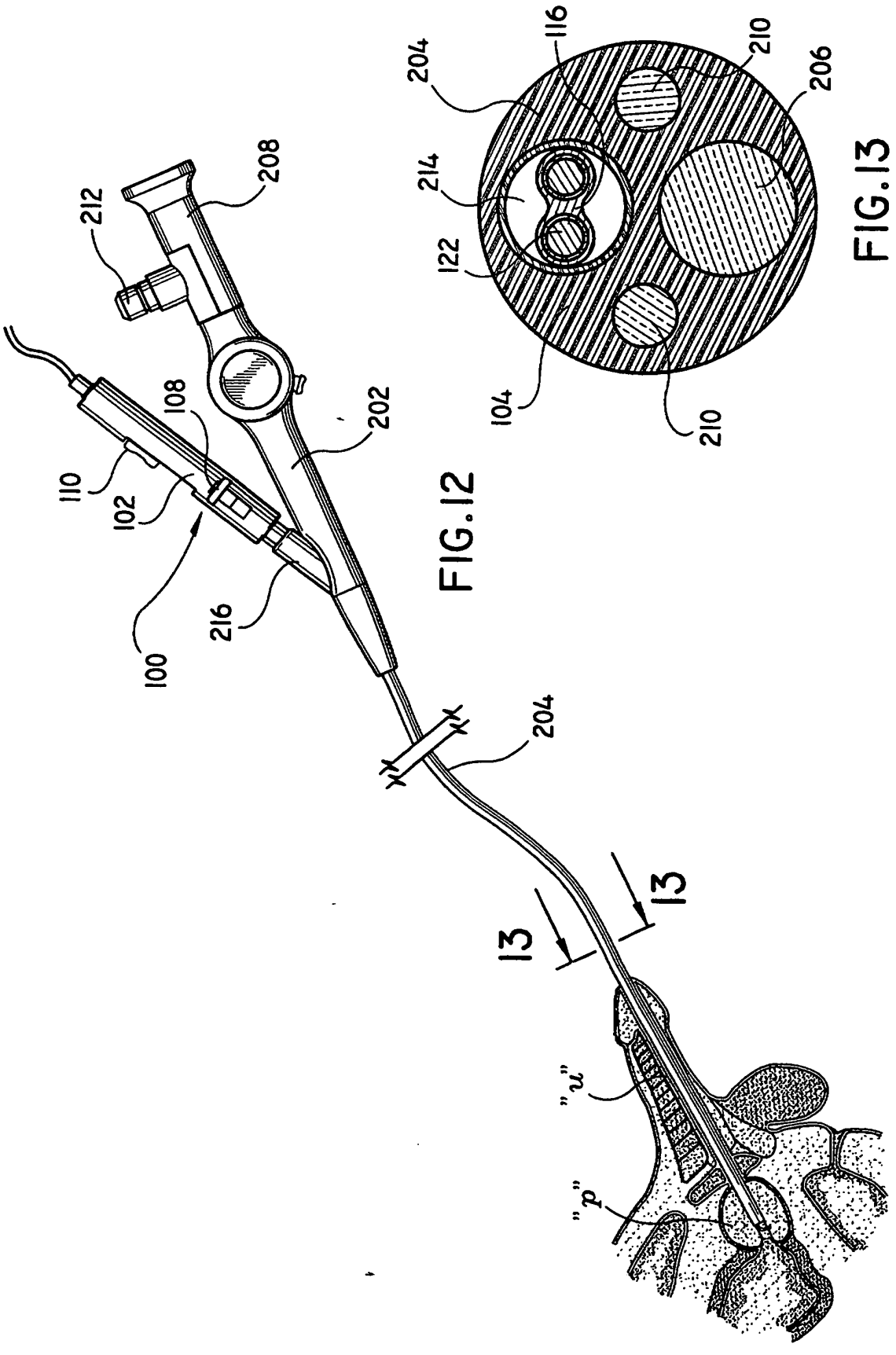
212
208
108
110
102
100
216
202
204
13
13
"u"
"p"

FIG.12

204
116
210
206
214
122
104
210

FIG.13

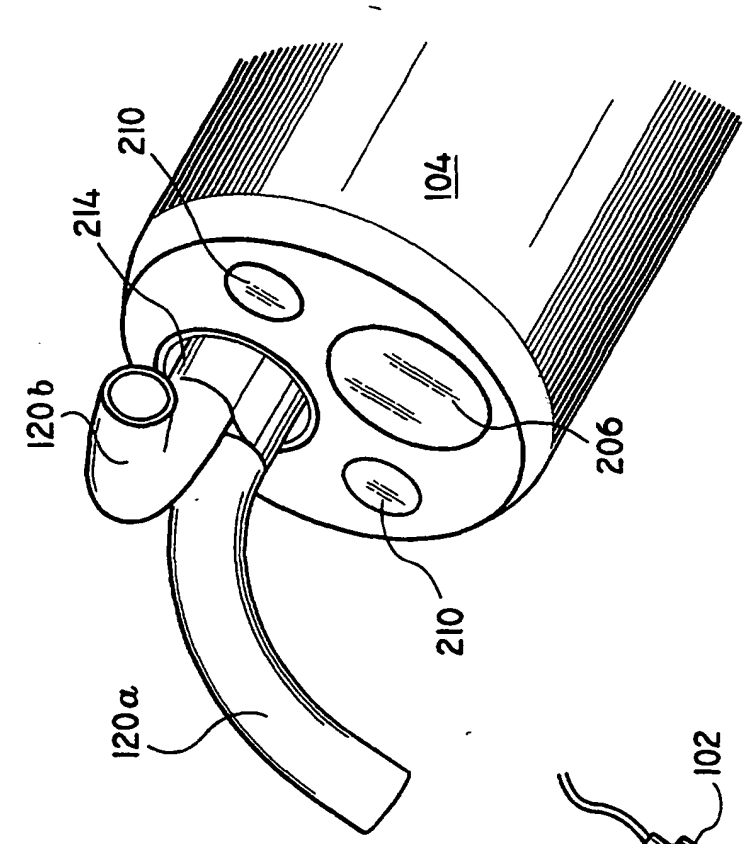

FIG. 16

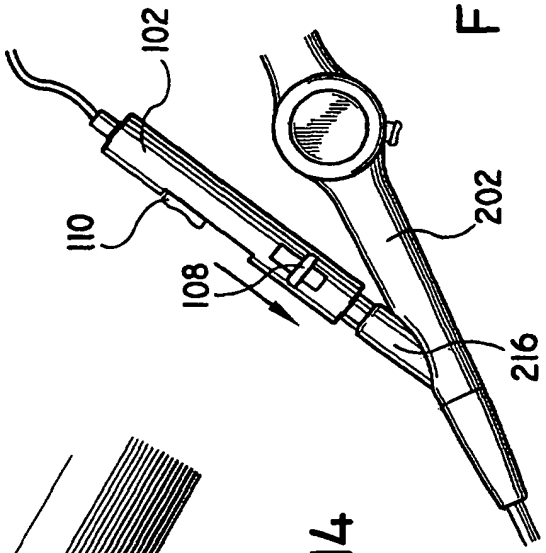

FIG. 15

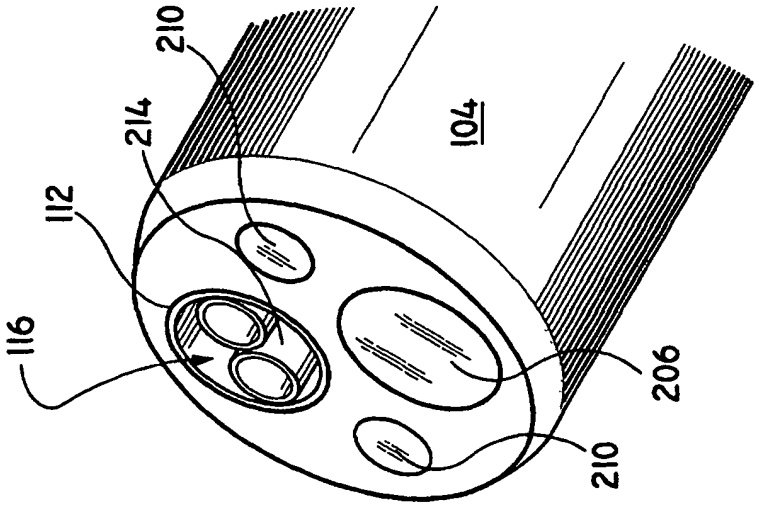

FIG. 14

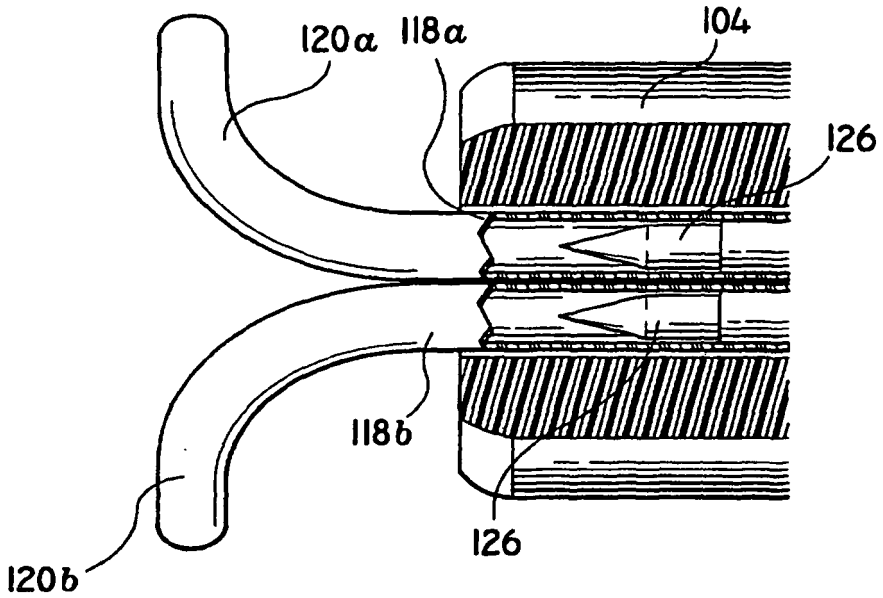

FIG.17

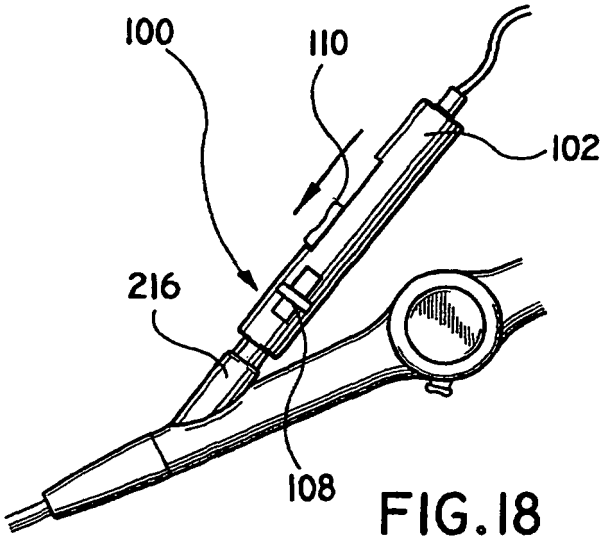

FIG.18

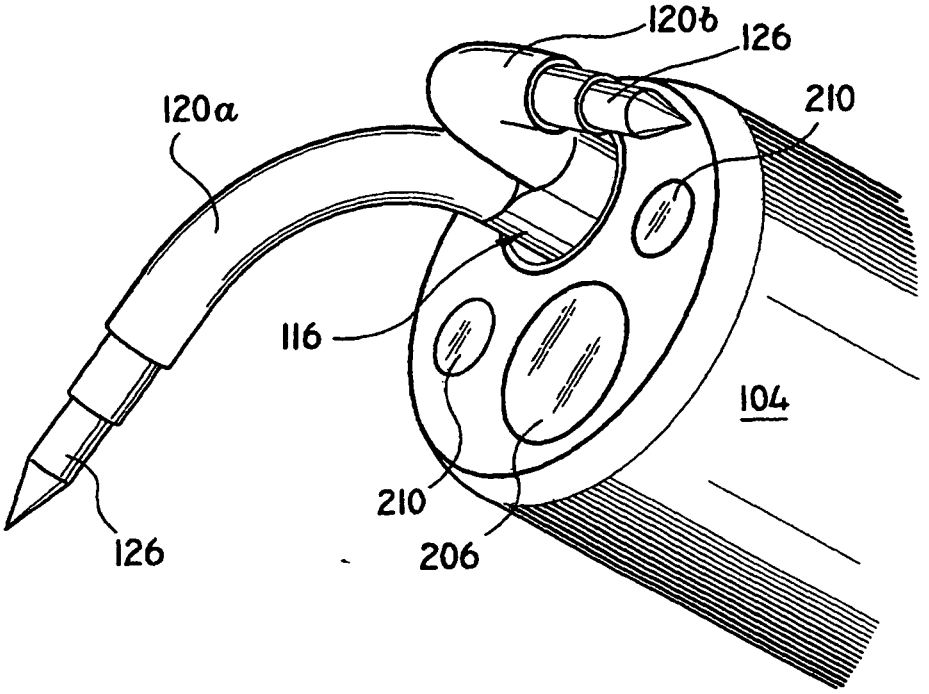
120b
126
210
120a
116
104
210
126
206

FIG.19

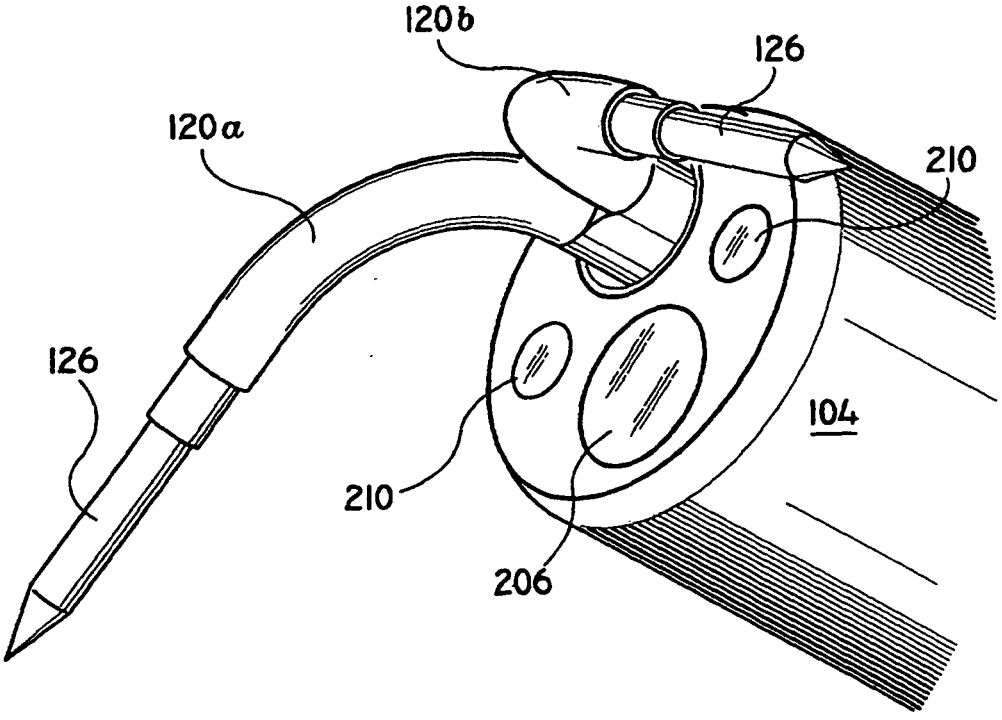
120b
126
120a
210
126
104
210
206

FIG.20

REFERENCES CITED IN THE DESCRIPTION

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